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THE IDENTIFICATION AND CLASSIFICATION OF THE CELLS OF THE BLOOD AND MARROW*

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The first essential to accurate identification of the cells of the blood or marrow is a satisfactory smear and stain.

Making the Smear. To obtain a good smear, place a small drop of blood or sternal marrow one-half inch from the end of a *clean* slide. Place this slide on a firm surface. Select a second slide having a smooth edge free from nicks and, holding it at an angle of about 60° to the first slide, draw it back until it just touches the blood. Then let the drop of blood follow the second slide as it is moved across the first one with a smooth, even motion. The drop of blood should be of such size that the smear runs completely out before reaching the end. The thickness of the smear should be

* This material is taken from Chapter I of the Atlas of Hematology by Edwin E. Osgood and Clarice M. Ashworth, published by J. W. Stacey, San Francisco, 1937. The nomenclature used is explained in the Atlas and also in Osgood, E. E.: Histogenesis, Classification and Identification of the Cells of the Blood and Marrow, Based on Cultures and Hematologic Studies of Human Marrow and Blood. Am. J. Clin. Path., 8:59-74, (Jan.) 1938.

* *Read before the American Society of Medical Technologists, Atlantic City,* 1937.

regulated by the rate of movement of the smearing slide, i.e., the slower the motion the thinner will be the smear, and vice versa. A good smear should have a smooth, even surface, free from ridges or waves, and under the microscope the red cells at the thinner end should not touch one another.

Staining. To obtain a good stain it is essential that the absolute methyl alcohol used for dissolving the Wright's stain be kept tightly stoppered at all times and be absolutely anhydrous. The Wright's stain, after it is made up by shaking 0.1 gram of the stain with 20.0 cubic centimeters of methyl alcohol, should be kept in a tightly stoppered bottle, and filtered at least once a week into a small bottle for current use. This bottle should be kept tightly stoppered.

To stain the smear, cover with Wright's stain for one to two minutes and then add an equal volume of a buffer phosphate solution* having a pH of 6.4, prepared by dissolving 6.63 grams of monopotassium phosphate and 2.56 grams of anhydrous disodium phosphate in one liter of distilled water, adding about 1.0 cubic centimeter of chloroform. The use of this phosphate solution instead of distilled water is very important if really good stains are to be secured.

When each new lot of stain is made up, test the time of exposure to the buffer phosphate by staining a series of slides, varying the time after mixing the phosphate and stain by one minute intervals from one to ten minutes and note which time gives the best results with this particular stain. As a rule, smears made from sternal marrow should have about double the time after addition of the buffer phosphate that is required for smears made from blood. At the end of the staining time, holding the slide horizontally so as not to pour off the stain, wash it with a brisk stream of running tap water for at least thirty seconds. Then stand it on edge until dry.

A good stain should show no precipitate or debris between the cells. The red cells should stain an orange-buff, the neutrophil granules should stain a shade of lilac, and monocyte granules should be clearly visible. If the colors in the cells are to appear as described, northern daylight or a light source with a blue daylight filter should be used. Some microscopic lamps give a yellow light which is unsatisfactory for correct evalution of color.

Examination of Stained Smears. When examining the slide,

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* This solution may be purchased already prepared from the Shaw Supply Company, Portland, Oregon.

cover its surface with cedar oil or mineral oil and survey it first under high power or, better, with an 8 millimeter objective and 10 x eye piece (magnification x 200) for its general features. Locate an area in which the individual cells do not touch each other for examination with the oil immersion lens. This is important because in thick areas where red cells touch each other, the cells are so distorted that even expert hematologists may be unable to identify them. If for any reason the cells are too scarce for counting, do not attempt to make a thicker smear but centrifuge the blood, draw off the excess plasma, remix, and make a thin smear. If the red cell count is high but the white cell count is low, centrifuge and draw off the buffy coat along with a little plasma and a little of the red cell layer, mix, and make a thin smear.

System for Cell Identification. The diagnosis of disease of the blood and blood-forming organs depends not on a glance in the microscope but on the ability to identify each cell seen in the blood or marrow. The author, however, has not been able to find any book or article which will tell the person not already well versed in hematology how to identify a cell, the name of which is not already known.

The following system has, therefore, been developed to permit anyone to identify any cell encountered in a properly stained preparation. It is based on answering a series of simple questions, suggested by the headings in tables 2 to 6, just as are the systems used in qualitative chemical analysis. The first question is, does the cell contain neutrophil, eosinophil, basophil, or azurophil granules? Neutrophil granules are small, uniform in size, uncountably numerous, and stain a shade of lilac. Eosinophil granules are large, round, uniform in size, and stain orange-red with pale centers. An occasional eosinophil granule stains blue in good stains; all may stain blue in poor stains. Basophil granules vary in size from small to large in the same cell, are fewer in number than neutrophil or eosinophil granules, and stain a bluish-red entirely different from the color of the nucleus. Azurophil granules stain exactly the same color as the nucleus of the cell in which they are found but may be darker or paler, and vary in number from a very few to many. They may be grouped or diffusely scattered through the cytoplasm.

Having learned to recognize the granules, determine what kind of granule the cell under consideration contains and look up further identification in the tables as listed below.

TABLE 1. NOMENCLATURE

Name of Series	Recommended name	Names which have been applied to the same cell
Lymphocyte	Lymphoblast	Myeloblast[1], hemocytoblast[2], lymphoidocyte[3], stem cell, lymphocyte[4 5]
	Prolymphocyte	Large lymphocyte[6], pathologic large lymphocyte[6], atypical leukocytoid lymphocyte[3], monocyte[3]
	Lymphocyte	Small, medium, or large lymphocyte, normal lymphocyte, small, medium or large mononuclear
Monocyte	Monoblast	Myeloblast[1], hemocytoblast[2], lymphoidocyte[3], lymphocyte[4 5], stem cell, immature monocyte
	Promonocyte	Premonocyte[7], hemohistioblast[2], immature monocyte
	Monocyte	Large mononuclear[8], transitional[9], clasmatocyte[9], endothelial leukocyte[4], histiocyte[10], resting wandering cell[4]
Granulocyte (Myeloid)	Granuloblast	Myeloblast[1 6], hemocytoblast[2], lymphoidocyte[3], lymphocyte[4 5], stem cell
	Progranulocyte S*	Promyelocyte I[6], myelocyte A[6], myelocyte, non-filament[11], class I[12]
	Progranulocyte A	Promyelocyte II[6], leukoblast [3], basophil myelocyte[12], myeloblast[3], premyelocyte[9]
	Granulocyte	Myelocyte[6], myelocyte B[6], non-filament[11], Class I[12]
	Metagranulocyte	Metamyelocyte[6], juvenile[14], myelocyte C[6], non-filament[11], class I[12]
	Rhabdocyte	Staff cell[6], stab cell[14], band cell[15], non-filament[11], class I[12], rod nuclear[16], polymorphonuclear
	Lobocyte	Segmented neutrophil[6], polymorphonuclear, filamented[11], class II, III, IV or V[12]
Plasmacyte	Plasmablast	Myeloblast[1], hemocytoblast[2], lymphoidocyte[3], lymphocyte[4 5], stem cell, lymphoblastic plasma cell[1]
	Proplasmacyte	Türk cell[6], Türk irritation form, lymphoblastic or myeloblastic plasma cell[1 6]
	Plasmacyte	Plasma cell[6], Unna's plasma cell, Marschalko plasma cell, plasmacytoid lymphocyte[1 3]
Erythrocyte	Karyoblast	Megaloblast[6], myeloblast[1], hemocytoblast[2], lymphoidocyte[3], lymphocyte[4 5], stem cell promegaloblast[1], basophilic normoblast[3], primitive erythroblast[9]
	Prokaryocyte	Erythroblast, megaloblast[6], orthochromatic normoblast[1], basophilic normoblast[3], polychromatophilic normoblast[3], macronormoblast[15], macroblast[16]
	Karyocyte	Normoblast[6], pronormoblast[3], macronormoblast[15], erythroblast, polychromatophilic normoblast[1]
	Metakaryocyte	Normoblast[6]
	Reticulocyte	
	Akaryocyte	Erythrocyte, red blood cell, erythroplastid, normocyte[10]
Thrombocyte	Megalokaryoblast	Megakaryoblast
	Promegalokaryocyte	Promegakaryocyte
	Megalokaryocyte	Megakaryocyte
	Platelet	Thrombocyte, thromboplastid
	Disintegrated cell	Senile cells, smudge, basket cell, smear cell, degenerated cell

*Any basophil from the progranulocyte to the lobocyte is sometimes referred to as a *mast cell*.

Granules	See table
Neutrophil	2
Eosinophil	3
Basophil	4
Azurophil	5
No granules	6

TABLE 2. NEUTROPHIL GRANULES*

Nucleoli	Nucleus	Name of cell	Number
Present	Round or oval	Neutrophil progranulocyte S (Neutrophil promyelocyte I)	66
Absent	Round or oval	Neutrophil granulocyte (Neutrophil myelocyte)	70-73
	Bean or kidney-shaped	Neutrophil metagranulocyte (Neutrophil metamyelocyte)	74-75
	Curved rod	Neutrophil rhabdocyte (Neutrophil staff cell)	76-79
	Lobed or segmented	Neutrophil lobocyte (Polymorphonuclear)	80-85

*If the granules are scarce, big, and blue, or the cytoplasm contains vacuoles or is bluer than normal, they are toxic neutrophils (87-92) but are classified otherwise as in the table.

TABLE 3. EOSINOPHIL GRANULES

Nucleoli	Nucleus	Name of cell	Number
Present	Round or oval	Eosinophil progranulocyte S (Eosinophil promyelocyte I)	93-94
Absent	Round or oval	Eosinophil granulocyte (Eosinophil myelocyte)	95-96
	Bean or kidney-shaped	Eosinophil metagranulocyte (Eosinophil metamyelocyte)	97-99
	Curved rod	Eosinophil rhabdocyte (Eosinophil staff cell)	100-102
	Lobed or segmented	Eosinophil lobocyte (Eosinophil polymorphonuclear)	103-105

TABLE 4. BASOPHIL GRANULES

Nucleoli	Nucleus	Name of cell	Number
Present	Round or oval	Basophil progranulocyte S (Basophil promyelocyte I)	107-108
Absent	Round or oval	Basophil granulocyte (Basophil myelocyte)	109-110
	Bean or kidney-shaped	Basophil metagranulocyte (Basophil metamyelocyte)	111
	Curved rod	Basophil rhabdocyte (Basophil staff cell)	112-113
	Lobed or segmented	Basophil lobocyte (Basophil polymorphonuclear)	114-115

TABLE 5. AZUROPHIL GRANULES

Diameter of cell in relation to lobocyte	Size of granules	Nucleoli	Chromatin structure	Shape of nucleus	Peroxidase stain	Name of cell	Number
Same or smaller	Coarse	Present or absent	Coarse in clumps	Round or oval, sometimes irregular or cloverleaf	Negative	Lymphocyte	17-19, 22-24
Larger	Coarse	Present or absent	Coarse	Round or oval, rarely irregular or cloverleaf	Negative	Prolymphocyte	10-11, 13-15
				Round or oval, rarely horseshoe	Positive	Progranulocyte A (Promyelocyte II)	60-66
			Very coarse	Round or oval	Negative	Plasmacyte†	120
		Present	Fine	Round or oval, rarely horseshoe*	Negative	Lymphoblast or granuloblast	4-5, 56
	Fine, diffuse	Present	Fine	Round or oval	Negative	Monoblast	31, 33-35
				Horseshoe or irregular	Positive or negative	Promonocyte	37-40
		Absent	Coarse clumps and strands	Horseshoe or irregular	Positive or negative	Monocyte	42-51
3 times as large	Fine, diffuse	Absent	Coarse clumps and strands	Horseshoe or irregular	Negative	Megalokaryocyte	310-311

*Rieder cell †Cytoplasm opaque. Plasma cells with azurophil granules are very rare.

TABLE 6. No GRANULES. ALL HAVE ROUND OR OVAL NUCLEI

Cytoplasm	Nucleoli	Chromatin structure	Diameter of nucleus in relation to diameter of cell	Size of cell in relation to neutrophil lobocyte	Peroxidase stain	Name of cell	Numbers
Opaque	Absent	Pycnotic	Less than half	Smaller	Negative	Metakaryocyte*† (Normoblast)	155-162
		Coarse	Less than two-thirds	Smaller	Negative	Karyocyte*† (Pronormoblast)	146-154
			More than two-thirds	Same or larger	Negative	Prokaryocyte* (Erythroblast)	139-145
			Less than half	Usually larger	Negative	Plasmacyte†	125-129
	Present	Coarse	Less than half	Usually larger	Negative	Proplasmacyte	119-122, 124
		Fine	Less than two-thirds	Usually larger	Negative	Plasmablast	118
			More than two-thirds	Same or larger	Negative	Karyoblast* (Megaloblast)	132-134, 137
Transparent	Present	Fine	More than half	Usually larger	Negative	Lymphoblast, monoblast, granuloblast (Myeloblast)	1-3, 22, 52-58
	Present or absent	Coarse	More than half	Larger	Positive	Progranulocyte A (Promyelocyte II)	59
					Negative	Prolymphocyte	6-9, 12
				Same or smaller	Negative	Lymphocyte	20-21, 25-27

*May or may not contain hemoglobin. Other nucleated cells never contain hemoglobin.
†Sometimes two or more nuclei in one cell.

If neutrophil, eosinophil, or basophil granules are present (tables 2 to 4), the next question to ask is, does the nucleus contain nucleoli? These are blue staining, structureless areas within the nucleus. If it does, and the nucleus is round or oval, the cell is the progranulocyte S (promyelocyte I) corresponding to the type of granule. If nucleoli are absent, the next question to ask is, what is the shape of the nucleus? According to the shape of the nucleus, the name of the cell is given in table 2, 3 or 4.

Note that in the tables the column headed "Number" give the numbers in bold face type of the corresponding cells and cell descriptions in the Atlas, making an index to aid in comparison of the pictures and comments with the cell under consideration. This last column also serves as an index to any specific feature of the cells. All numbers in table 2 refer to cells with neutrophil granules, all numbers in table 3 refer to cells with eosinophil granules, and all numbers in table 4 refer to cells with basophil granules, so that one can learn the variations in morphology of these granules by comparing these different cells. In the same way, by comparing the pictures corresponding to the numbers opposite "Nucleoli present" and Nucleoli absent," one can learn what nucleoli are.

If the cells contains azurophil granules (table 5), the first question is, is the diameter of the cell significantly greater than 15 micra, the size of the larger neutrophil lobocytes (polymorphonuclears)? The second question is, are the granules fine and diffusely scattered or are they large and in groups? The third question is, does the nucleus contain nucleoli? The fourth question is, what is the chromatin structure in the nucleus? A fine chromatin structure is one in which the nucleus appears to be overlaid by a darker staining, lace-net-mesh work with no areas of appreciable size standing out as darker or lighter staining than other areas. In a coarse chromatin structure, some areas of appreciable size in the nucleus are darker than others. The fifth question is, what is the shape of the nucleus? A round or oval nucleus needs no explanation, and a horseshoe nucleus is illustrated by the Rieder lymphoblast, promonocyte and monocyte. An irregularly shaped nucleus is illustrated by the Rieder lymphoblast, the promonocyte and the monocyte, and the cloverleaf nucleus is illustrated by the lymphocyte. The sixth question is, is the peroxidase stain positive or negative? The peroxidase stain is only necessary in differentiating the progranulocyte A (promyelocyte II) from the prolymphocyte. A positive stain shows black staining granules in the cytoplasm. As with the previous tables, the cell numbers serve as an index to any criterion mentioned in the table. For example, comparing all pictures corresponding to the numbers opposite fine chromatin structure with

those opposite coarse chromatin structure will aid in understanding what is meant by these terms.

In table 6, the questions to ask in regard to cells having no granules are indicated. First, is the cytoplasm opaque or transparent? An opaque cytoplasm looks as if it had been drawn with crayons, whereas a transparent cytoplasm looks as if it had been drawn with water colors. The remaining questions are similar to those already discussed for table 5. It may be worth while to point out, however, that the course chromatin structure of the nucleus of the cells of the erythrocyte and plasmacyte series differs from that in the progranulocyte (promyelocyte) and lymphocyte series in having a very sharp demarcation between the dark-staining basichromatin and the light-staining oxychromatin areas. The latter group of cells have a gradual transition between the dark and light areas of the nucleus. An important point of difference in the chromatin structure between the plasmacyte and the karyocyte (pronormoblast) and prokaryocyte (erythroblast) is that in the plasmacyte the individual masses of basichromatin are much larger than are the individual masses of basichromatin in the cells of the erythrocyte series. In this table, as in the others, the numbers in bold face type in the last column serve as an index to illustrations and descriptions of the cells in the Atlas of Hematology which will permit anyone to look up in the illustrations exactly what is meant by any of these criteria.

APPROVED SCHOOLS FOR CLINICAL LABORATORY TECHNICIANS*

The report on the original survey of 196 schools in the United States, in which the method of examining schools and the findings are described, appeared in the Educational Number of *The Journal of the American Medical Association,* Aug. 29, 1936. Inspections of schools continue as a regular part of the Council's work and the revisions of the approved list are made regularly. The accompanying list represents the fourth printing and contains the names of 136 schools conforming to the minimum requirements.

In 1937 the Council voted to increase the admission requirement from one to two years of college work including basic sciences. In agreement with the Board of Registry of the American Society of Clinical Pathologists, this ruling became effective Jan. 1, 1938.

Although almost all larger hospitals admit occasional students or volunteers for training as technicians for whom no systematic course of instruction can be provided, the Council does not regard such casual apprenticeships as justifying recognition as a school.

The adoption of standards for laboratory schools by the American Medical Association and the publication of lists of approved schools have already guided hundreds, who aspire to this field, away from the advertising commercial schools into acceptable courses of training. Hospitals throughout the country are recognizing more and more that graduation from an approved school or registration is the most reliable means of identifying qualified technicians. Thus, uncontrolled education of laboratory technicians by commercial schools is no longer accepted as satisfactory.

Training in commercial schools alone will not permit students to enter examinations of the Board of Registry of the American Society of Clinical Pathologists.

More detailed information may be obtained from the directors of individual schools or by addressing the Council on Medical Education and Hospitals.

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Approved Schools for Clinical Laboratory Technicians

The following list of schools for clinical laboratory technicians represents the fourth printing made since the House of Delegates of the American Medical Association adopted standards for such schools in 1936.

	Name and Location of School	Director	Entrance Requirement	Hospital Bed Capacity	Yearly Admissions	Duration of Course	Number of Students	Tuition	Certificate, Diploma, Degree	
	ARKANSAS									
1	University of Arkansas (Little Rock City Hospital), Little Rock[1]	J. J. Andújar, M.D.	2 yrs. coll.	175	2,037	12 mos.	4	$100	Certificate	1
	CALIFORNIA									
2	Children's Hospital, Los Angeles[2]	C. M. Hyland, M.D.	Coll. degree	193	4,134	12 mos.	3	None	None	2
3	College of Medical Evangelists (White Memorial Hospital), Los Angeles	O. B. Pratt, M.D.	2 yrs. coll.	174	5,288	12 mos.	6	$100	Certificate	3
4	Los Angeles County Hospital, Los Angeles	N. G. Evans, M.D.	Coll. degree	2,837	53,717	15 mos.	8	$60	Certificate	4
5	Huntington Memorial Hospital, Pasadena	A. G. Foord, M.D.	3 yrs. coll.	174	5,661	12 mos.	3	None	Certificate	5
6	Mary's Help Hospital, San Francisco	Z. E. Bolin, M.D.	2 yrs. coll.	118	4,141	18 mos.	.....	.....	.....	6
7	St. Luke's Hospital, San Francisco	W. P. Stowe, M.D.	2 yrs. coll.	200	5,417	24 mos.	4	None	Certificate	7
8	University of California Hospital, San Francisco	I. C. Schumacher, M.D.	2 yrs. coll.	273	6,386	16 mos.	4	None	None	8
	COLORADO									
9	Children's Hospital, Denver[3]	E. I. Dobos, M.D.	2 yrs. coll.	300	3,068	12 mos.	2	None	Certificate	9
10	University of Denver, Denver[4]	Philip Hillkowitz, M.D.	High sch. grad.	.....	.....	4 yrs.	52	$225 yr.	B.S.	10
	GEORGIA									
11	University of Georgia School of Medicine (University Hospital), Augusta[5]	E. R. Pund, M.D.	Coll. degree	320	8,266	12 mos.	4	$100	Certificate	11
12	Emory University, Emory University[6]	R. R. Kracke, M.D.	B.S.	.....	.....	18 mos.	8	$225 yr.	M.S.	12
	ILLINOIS									
13	Michael Reese Hospital, Chicago	K. M. Howell, M.D.	2 yrs. coll.	595	17,830	12 mos.	12	$100	Certificate	13
14	Mt. Sinai Hospital, Chicago	I. Davidsohn, M.D.	2 yrs. coll.	176	6,520	18 mos.	5	$125	Diploma	14
15	Northwestern University Medical School (Passavant Memorial Hospital), Chicago	H. L. Alt, M.D.	2 yrs. coll.	177	4,637	12 mos.	8	$50	Certificate	15
16	Evanston Hospital, Evanston	E. L. Benjamin, M.D.	Coll. degree	228	8,604	12 mos.	4	$100	Certificate	16
17	St. John's Hospital, Springfield	F. W. Light, M.D.	2 yrs. coll.	360	10,707	12 mos.	5	$50	None	17
18	St. Therese's Hospital, Waukegan	Ernest Pribram, M.D.	2 yrs. coll.	150	2,668	12 mos.	2	$100	Diploma	18
	INDIANA									
19	Indianapolis City Hospital, Indianapolis	H. C. Thornton, M.D.	2 yrs. coll.	634	10,647	18 mos.	2	$50	Certificate	19
20	Indiana University School of Medicine (Indiana University Hospitals), Indianapolis	C. G. Culbertson, M.D.	Coll. degree	466	9,421	12 mos.	4	None	Diploma	20
21	Methodist Episcopal Hospital, Indianapolis	H. M. Banks, M.D.	B.S. or B.A.	505	22,200	24 mos.	5	None	Certificate	21
22	South Bend Medical Laboratory, South Bend[7]	A. S. Giordano, M.D.	2 yrs. coll.	.....	.....	18 mos.	3	$125 yr.	None	22

Approved Schools for Clinical Laboratory Technicians—Continued

	KANSAS									
23	Bethany Methodist Hospital, Kansas City	W. W. Summerville, M.D.	Coll. degree	120	2,554	12 mos.	3	None	Certificate	23
24	University of Kansas Hospitals, Kansas City	C. G. Leitch, M.D.	Coll. grad.	300	5,726	12 mos.	7	Univ. fees	Certificate	24
25	St. Francis Hospital, Wichita	C. A. Hellwig, M.D.	2 yrs. coll.	275	6,030	12 mos.	6	$150	Diploma	25
26	Wichita Hospital, Wichita	M. L. Jones, M.D.	2 yrs. coll.	100	2,416	12 mos.	2	$150	Certificate	26
	KENTUCKY									
27	St. Joseph's Hospital, Lexington[8]	E. S. Maxwell, M.D.	2 yrs. coll.	197	6,707	12 mos.	4	$150	Certificate	27
28	University of Kentucky, Lexington[9]	M. Scherago, D.V.M.	High sch. grad.	.....	.....	4 yrs.	60	Univ. fees	B.S.	28
29	St. Joseph Infirmary, Louisville	H. M. Weeter, M.D.	2 yrs. coll.	320	6,390	12 mos.	5	$150	None	29
30	SS. Mary and Elizabeth Hospital, Louisville	H. M. Weeter, M.D.	2 yrs. coll.	135	3,928	12 mos.	3	$120	None	30
31	State Board of Health, Louisville[10]	L. H. South, M.D.	2 yrs. coll.	.....	.....	12 mos.	28	$300	Diploma	31
	LOUISIANA									
32	Loyola University, New Orleans[11]	J. G. Arnold, Jr., Ph.D.	High sch. grad.	.....	.....	4 yrs.	25	Univ. fees	B.S.	32
	MAINE									
33	Central Maine General Hospital, Lewiston[13]	Julius Gottlieb, M.D.	B.S. or B.A.	186	3,737	15 mos.	3	$100	Certificate	33
	MARYLAND									
34	Mercy Hospital, Baltimore	H. T. Collenberg, M.D.	2 yrs. coll.	255	8,178	18 mos.	14	$150	Certificate	34
	MASSACHUSETTS									
35	Simmons College (Faulkner Hospital), Boston[12]	C. M. Hilliard, A.B.	Coll. degree	144	3,915	12 mos.	4	$300	Certificate	35
36	Mercy Hospital, Springfield	J. E. Dwyer, M.D.	2 yrs. coll.	330	5,853	12 mos.	5	None	Certificate	36
37	Worcester City Hospital, Worcester	R. H. Goodale, M.D.	2 yrs. coll.	480	9,507	12 mos.	6	None	Certificate	37
38	Worcester State Hospital, Worcester[14]	J. M. Looney, M.D.	Coll. degree	2,334	2,342	12 mos.	2	None	Certificate	38
	MICHIGAN									
39	Leila Y. Post Montgomery Hospital, Battle Creek[15]	A. A. Humphrey, M.D.	2 yrs. coll.	140	4,021	12 mos.	3	$25	Certificate	39
40	Mercy Hospital, Bay City[16]	W. G. Gamble, Jr., M.D.	2 yrs. coll.	140	5,314	12 mos.	.....	$150	Certificate	40
41	City of Detroit Receiving Hospital (Wayne University), Detroit	O. A. Brines, M.D.	3 yrs. coll.	650	21,365	12 mos.	6	None	B.S.	41
42	Grace Hospital, Detroit	C. I. Owens, M.D.	2 yrs. coll.	458	15,444	12 mos.	6	$150	Certificate	42
43	Henry Ford Hospital (Wayne University), Detroit	F. W. Hartman, M.D.	B.S. or B.A.	572	10,045	18 mos.	10	None	M.S.	43
44	Providence Hospital, Detroit	J. E. Davis, M.D.	B.S. or B.A.	309	12,961	12 mos.	5	$50	Diploma	44
45	Wayne University, Detroit[17]	C. W. Creaser, Ph.D.	High sch. grad.	.....	.....	4 yrs.	35	Univ. fees	B.S.	45
46	Woman's Hospital, Detroit	D. C. Beaver, M.D.	3 yrs. coll.[a]	225	7,034	12 mos.	4	None	B.S.[b]	46
47	Michigan State College, East Lansing[18]	Ward Giltner, D.V.M.	High sch. grad.	.....	.....	4 yrs.	64	Coll. fees	B.S.	47
48	William J. Seymour Hospital, Eloise	S. E. Gould, M.D.	3 yrs. coll.[c]	1,450	7,452	12 mos.	3	None	B.S.[b]	48
	MINNESOTA									
49	College of St. Scholastica (St. Mary's Hospital), Duluth	G. L. Berdez, M.D.	High sch. grad.	260	5,343	4 yrs.	20	Coll. fees	B.S.	49
50	St. Luke's Hospital, Duluth	A. H. Wells, M.D.	2 yrs. coll.	237	6,089	18 mos.	4	None	.....	50
51	Fairview Hospital, Minneapolis	Looe Baker, M.D.	2 yrs. coll.	200	4,258	24 mos.[d]	2	$100	Certificate	51
52	Minneapolis General Hospital, Minneapolis [e]	N. H. Lufkin, M.D.	Coll. grad.	616	10,021	12 mos.	6	None	None	52
53	Northwestern Hospital, Minneapolis	M. I. Smith, M.D.	2 yrs. coll.	165	7,341	12 mos.	2	None	Certificate	53
54	Swedish Hospital, Minneapolis	C. R. Drake, M.D.	2 yrs. coll.	225	6,156	24 mos.[d]	8	$125 yr.	Certificate	54
55	University of Minnesota, Minneapolis[19]	W. A. O'Brien, M.D.	High sch. grad.	.....	.....	4 yrs.	260	$100	B.S.	55
56	Charles T. Miller Hospital (Macalester College), St. Paul [f]	Kano Ikeda, M.D.	3 yrs. coll.	225	6,103	12 mos.	6	$110	B.A.	56

	MISSISSIPPI									
57	Vicksburg Sanitarium and Crawford Street Hospital, Vicksburg[30]	L. S. Lippincott, M.D.	2 yrs. coll.	75	2,249	24 mos.	6	None	Certificate	57
	MISSOURI									
58	University of Missouri School of Medicine, Columbia[31]	M. P. Neal, M.D.	4 yrs. coll.	.....	.....	12-18 mos.	3	Univ. fees	None	58
59	Kansas City Health Department Laboratory, Kansas City[32]	R. E. Duncan, M.D.	2 yrs. coll.	.....	.....	18 mos.	15	None	Certificate	59
60	Menorah Hospital, Kansas City	R. Koritschoner, M.D.	Coll. degree	130	3,367	15 mos.	4	None	None	60
61	Research Hospital, Kansas City	F. C. Narr, M.D.	2 yrs. coll.	200	5,795	12 mos.	6	None	None	61
62	St. Joseph Hospital, Kansas City	R. W. Kerr, M.D.	Coll. degree	220	5,106	24 mos.[g]	9	None	Certificate	62
63	St. Luke's Hospital, Kansas City	F. C. Helwig, M.D.	2 yrs. coll.	193	4,733	16 mos.[h]	9	$10	None	63
64	St. Mary's Hospital, Kansas City	C. G. Leitch, M.D.	Coll. grad.	150	4,317	12 mos.	5	$10	Certificate	64
65	St. Louis University School of Nursing, St. Louis[33]	A. E. Casey, M.D.	High sch. grad.	.....	.....	4 yrs.	26	Univ. fees	B.S.	65
	MONTANA									
66	State University of Montana, Missoula[34]	D. M. Hetler, Ph.D.	High sch. grad.	.....	.....	4 yrs.	31	Univ. fees	B.A.	66
	NEBRASKA									
67	Bryan Memorial Hospital, Lincoln[35]	M. J. Breuer, M.D.	2 yrs. coll.	100	2,410	12 mos.	2	None	Certificate	67
68	Lincoln General Hospital, Lincoln	J. M. Neely, M.D.	2 yrs. coll.	145	3,242	12 mos.	2	$30	Diploma	68
69	University of Nebraska Hospital, Omaha	J. P. Tollman, M.D.	2 yrs. coll.	210	3,558	12 mos.	6	None	Certificate	69
	NEW HAMPSHIRE									
70	Mary Hitchcock Memorial Hospital, Hanover[36]	R. E. Miller, M.D.	2 yrs. coll.	142	3,234	12 mos.	4	$50	Certificate	70
	NEW YORK									
71	Bender Hygienic Laboratory, Albany[37]	J. J. Clemmer, M.D.	2 yrs. coll.	.....	.....	14 mos.	7	$100	Certificate	71
72	Jewish Hospital, Brooklyn	Max Lederer, M.D.	Coll. grad.	540	15,181	18 mos.	7	None	Certificate	72
73	St. John's Hospital, Brooklyn	Kenneth Strong, M.D.	2 yrs. coll.	304	4,725	18 mos.	3	$75	None	73
74	Buffalo City Hospital, Buffalo	D. K. Miller, M.D.	2 yrs. coll.	1,025	10,532	24 mos.	8	None	Certificate	74
75	Buffalo General Hospital, Buffalo	K. L. Terplan, M.D.	Coll. grad.	437	10,760	12-15 mos.	6	$50	Certificate	75
76	St. Joseph's Hospital, Elmira	L. F. Bleyer, M.D.	2 yrs. coll.	189	3,640	12 mos.	3	$75	Certificate	76
77	New York Post-Graduate Medical School and Hospital, New York City	W. J. MacNeal, M.D.	Coll. grad.	410	9,554	12 mos.	.....	$500	.....	77
78	Rochester General Hospital, Rochester	I. A. Gáspár, M.D.	Coll. degree	312	8,533	18 mos.	4	None	Certificate	78
79	Ellis Hospital, Schenectady	Ellis Kellert, M.D.	R.N. or 2 yrs. coll.	251	8,359	12-18 mos.	8	None	Certificate	79
80	Russell Sage College (Samaritan Hospital), Troy	V. C. Jacobsen, M.D.	High sch. grad.	165	3,450	4 yrs.	4	Coll. fees	B.A.	80
	NORTH CAROLINA									
81	Duke Hospital, Durham	D. T. Smith, M.D.	2 yrs. coll.	400	10,954	16 mos.	12	$65	Certificate	81
	OHIO									
82	Institute of Pathology, Western Reserve University (University Hospitals), Cleveland	H. Goldblatt, M.D.	2 yrs. coll.	698	18,469	12 mos.	15	$50	Certificate	82
83	Mt. Sinai Hospital, Cleveland	B. S. Kline, M.D.	2 yrs. coll.	225	8,270	12 mos.	8	$265	Certificate	83
84	Starling-Loving University Hospital, Columbus	H. L. Reinhart, M.D.	B.S. or B.A.	256	5,289	12 mos.	5	$100	Certificate	84
85	White Cross Hospital, Columbus	R. S. Fidler, M.D.	B.S. or B.A.	243	7,003	12 mos.	3	None	Certificate	85
86	Huron Road Hospital, East Cleveland	Edward Goodsitt, M.D.	2 yrs. coll.	202	6,977	12 mos.	4	$100	None	86
87	College of Mount St. Joseph-on-the-Ohio, Mount St. Joseph[38]	R. J. Norris, M.D.	High sch. grad.	.....	.....	4 yrs.	3	Coll. fees	B.S.	87
88	Youngstown Hospital, Youngstown	G. B. Kramer, M.D.	2 yrs. coll.	372	9,919	12 mos.	2	None	None	88

Approved Schools for Clinical Laboratory Technicians—Continued

	OKLAHOMA									
89	St. Anthony's Hospital, Oklahoma City	Hugh Jeter, M.D.	B.S. or B.A.	300	9,076	12 mos.	3	None	None	89
90	State University and Crippled Children's Hospitals, Oklahoma City	Hugh Jeter, M.D.	B.S. or B.A.	418	6,455	12 mos.	3	None	None	90
	OREGON									
91	Emanuel Hospital, Portland	H. H. Foskett, M.D.	Coll. degree	265	8,557	12 mos.	2	$150	None	91
92	Good Samaritan Hospital, Portland	C. H. Manlove, M.D.	2 yrs. coll.	316	11,149	12 mos.	4	$150	None	92
93	St. Vincent's Hospital, Portland	T. D. Robertson, M.D.	2 yrs. coll.	384	10,406	12 mos.	3	None	None	93
94	University of Oregon, Portland[29]	M. F. Gourley, M.D.	2 yrs. coll.	.....	.....	12 mos.	4	None	Certificate	94
	PENNSYLVANIA									
95	Abington Memorial Hospital, Abington	John Eiman, M.D.	2 yrs. coll.	251	6,126	15 mos.	.....	.....	.....	95
96	Moravian College for Women, Bethlehem[30]	L. H. Beynon, D.Sc.	High sch. grad.	.....	.....	4 yrs.	35	Coll. fees	B.S.	96
97	St. Luke's Hospital, Bethlehem	H. A. Rothrock, Jr., M.D.	2 yrs. coll.	192	4,946	12 mos.	2	$75	Certificate	97
98	Bryn Mawr Hospital, Bryn Mawr	M. M. Strumia, M.D.	2 yrs. coll.	240	5,127	15 mos.	4	$125[1]	.....	98
99	Fitzgerald-Mercy Hospital, Darby	P. J. Kennedy, M.D.	R.N. or 2 yrs. coll.	200	4,263	12 mos.	2	None	Certificate	99
100	Harrisburg Hospital, Harrisburg	G. R. Moffitt, M.D.	2 yrs. coll.	239	6,358	12 mos.	6	None	Certificate	100
101	Harrisburg Polyclinic Hospital, Harrisburg	H. H. Van Horn, M.D.	Coll. degree	150	3,744	12 mos.	.....	None	Diploma	101
102	Bucknell University (Geo. F. Geisinger Memorial Hospital, Danville), Lewisburg	H. F. Hunt, M.D.	High sch. grad.	161	5,091	4½ yrs.	4	Univ. fees	B. S.	102
103	Germantown Dispensary and Hospital, Philadelphia	F. B. Lynch, Jr., M.D.	2 yrs. coll.	340	7,301	12 mos.	2	$100	Certificate	103
104	Jefferson Medical College Hospital, Philadelphia	B. L. Crawford, M.D.	2 yrs. coll.	631	13,015	14 mos.	7	$100	Certificate	104
105	Lankenau Hospital, Philadelphia	S. P. Reimann, M.D.	2 yrs. coll.	261	4,341	12 mos.	4	$25	Certificate	105
106	Mt. Sinai Hospital, Philadelphia	D. R. Meranze, M.D.	2 yrs. coll.	261	7,333	18 mos.	13	$150	Certificate	106
107	St. Agnes Hospital, Philadelphia	J. H. Smith, M.D.	2 yrs. coll.	346	7,166	18 mos.	6	$50	Diploma	107
108	St. Joseph's Hospital, Philadelphia	L. A. Soloff, M.D.	2 yrs. coll.	160	3,165	12 mos.	2	$100	Certificate	108
109	Temple University (Temple University Hospital), Philadelphia	F. W. Konzelmann, M.D.	High sch. grad.	379	9,681	4 yrs.	20	Univ. fees	B.S.	109
110	Reading Hospital (Albright College), Reading[f]	E. D. Funk, M.D.	3½ yrs. coll.	252	6,667	12 mos.	4	.....	B.S.	110
111	Moses Taylor Hospital, Scranton	C. L. Mattas, M.D.	Coll. degree	125	2,199	12 mos.	2	None	Diploma	111
112	Scranton State Hospital, Scranton	C. L. Mattas, M.D.	2 yrs. coll.	180	4,406	12 mos.	.....	None	None	112
	SOUTH CAROLINA									
113	Spartanburg General Hospital, Spartanburg	R. Mosteller, M.D.	2 yrs. coll.	304	5,267	18 mos.	3	None	Diploma	113
	TENNESSEE									
114	Knoxville General Hospital, Knoxville	R. H. Monger, M.D.	2 yrs. coll.	279	7,166	18 mos.	4	None	Diploma	114
115	John Gaston Hospital (University of Tennessee, Memphis[f]	H. C. Schmeisser, M.D.	B.S. or B.A.	489	14,567	13 mos.	4	None	Certificate	115
	TEXAS									
116	Hotel Dieu Hospital, Beaumont[31]	H. B. Williford, M.D.	2 yrs. coll.	161	2,903	24 mos.[g]	3	None	None	116
117	Baylor University Hospital, Dallas	J. M. Hill, M.D.	2 yrs. coll.	375	13,787	12 mos.	9	$100	Certificate	117
118	St. Paul's Hospital, Dallas	J. L. Goforth, M.D.	Coll. degree	270	8,947	12 mos.	3	$100	Certificate	118
119	John Sealy Hospital, Galveston	M. Bodansky, M.D.	2 yrs. coll.	422	5,835	12 mos.	9	$150	Certificate	119
120	St. Mary's Infirmary, Galveston[32]	W. L. Marr, M.D.	R.N. or 2 yrs. coll.	205	3,902	12 mos.	2	$150	Certificate	120
121	Robert B. Green Memorial Hospital, San Antonio	E. B. Ritchie, M.D.	2 yrs. coll.	175	4,942	12 mos.	8	$200	Certificate	121

	VIRGINIA									
122	College of William and Mary (Stuart Circle Hospital), Richmond [j]	H. H. Hibbs, Jr., Ph.D.	High sch. grad.	90	2,862	4 yrs.	8	Coll. fees	B.S.	122
123	Johnston-Willis Hospital, Richmond[aa]	S. W. Budd, M.D.	2 yrs. coll.	125	3,941	12 mos.	2	$100	None	123
124	Medical College of Virginia Hospital Division, Richmond	J. H. Scherer, M.D.	2 yrs. coll.	423	9,979	12 mos.	6	$100	Certificate	124
125	Stuart Circle Hospital, Richmond	R. C. Beck, M.D.	Coll. degree	90	2,862	12 mos.	3	$25	[k]	125
	WASHINGTON									
126	Deaconess Hospital, Spokane	J. D. Edgar, M.D.	B.S. or B.A.	227	4,988	12 mos.	3	None	None	126
127	Sacred Heart Hospital, Spokane	M. M. Patton, M.D.	Coll. degree	294	9,068	12 mos.	2	None	.....	127
128	St. Luke's Hospital (State College of Washington, Pullman), Spokane [f]	R. F. E. Stier, M.D.	3 yrs. coll.	175	3,388	12 mos.	3	$15	Diploma	128
129	St. Joseph's Hospital, Tacoma	C. R. McColl, M.D.	2 yrs. coll.	300	3,960	18 mos.	2	None	Certificate	129
130	Tacoma General Hospital, Tacoma	B. T. Terry, M.D.	B.S.	185	4,335	12 mos.	2	None	Diploma	130
	WISCONSIN									
131	Madison General Hospital, Madison	Lester McGary, M.D.	2 yrs. coll.	160	4,869	12 mos.	.....	None	None	131
132	St. Mary's Hospital, Madison	S. B. Pessin, M.D.	2 yrs. coll.	175	5,016	18 mos.	5	$25	Diploma	132
133	University of Wisconsin (State of Wisconsin General Hospital), Madison	W. D. Stovall, M.D.	High sch. grad.	650	11,689	4 yrs.	14	Univ. fees	B.S.	133
134	Milwaukee Hospital, "The Passavant," Milwaukee	H. K. B. Allebach, M.D.	2 yrs. coll.	223	7,158	12 mos.	3	$25	Certificate	134
135	St. Joseph's Hospital, Milwaukee	J. C. Grill, M.D.	2 yrs. coll.	325	7,238	24 mos.	2	None	B.S.[l]	135
136	Milwaukee County General Hospital, Wauwatosa	J. C. Grill, M.D.	2 yrs. coll.	1,050	16,832	24 mos.	4	None	Certificate	136

NOTES

a. Students from other than affiliated colleges must have B.S. degree.
b. From Wayne University, Detroit, or Michigan State College. East Lansing.
c. Students from other than affiliated colleges must have degree.
d. Includes twelve months x-ray training.
e. Also takes students in fourth year from University of Minnesota for B.S. degree.
f. Students admitted from other than affiliated college.
g. Includes six months x-ray training.
h. Includes three months x-ray training.
i. For lunches, laundry and coverage for breakage.
j. Students admitted from other colleges.
k. Credit may be applied toward B.S. degree following three years at College of William and Mary.
l. From Marquette University, Milwaukee.

ADDITIONAL AFFILIATIONS

	No. of Beds	Yearly Admissions
1. Folsom Clinic, Little Rock	.....	.....
2. Los Angeles City Health Department Laboratories, Los Angeles	.....	.....
3. St. Joseph's Hospital, Denver	260	5,059
4. Mercy Hospital, Denver	200	6,081
St. Anthony Hospital, Denver	154	2,981
Sanatorium of the Jewish Consumptives' Relief Society, Spivak	300	135
5. Public Health Laboratory, Augusta	.....	.....
6. Crawford W. Long Memorial Hospital, Atlanta	150	4,850
Grady Hospital, Atlanta	517	20,948
Emory University Hospital, Emory University	212	5,398
7. Epworth Hospital, South Bend	155	4,795
St. Joseph Hospital, South Bend	125	2,710
8. Lexington Clinic, Lexington	.....	.....
9. Lexington Clinic, Lexington	.....	.....
10. Kentucky Baptist Hospital, Louisville	130	4,180
Louisville City Hospital, Louisville	528	11,196
St. Joseph Infirmary, Louisville, and others	320	6,390
11. Hotel Dieu, Sisters Hospital, New Orleans	232	9,434
Mercy Hospital, New Orleans	118	3,025
Dr. J. T. Nix Clinic, New Orleans	.....	.....
12. Bath Memorial Hospital, Bath	50	733
Brunswick Hospital, Brunswick	46	578
Rumford Community Hospital, Rumford, and others	75	1,489
13. Boston Dispensary, Boston	.....	.....

	State Laboratory, Boston	.....	.....
14.	Wassermann Laboratory, Boston	.....	.....
15.	City Health Laboratory, Battle Creek	.....	.....
16.	Bay City General Hospital, Bay City	73	1,063
17.	City of Detroit Receiving Hospital, Detroit	650	21,365
	Grace Hospital, Detroit	458	15,444
	Woman's Hospital, Detroit	225	7,034
	William J. Seymour Hospital, Eloise	1,450	7,452
18.	Woman's Hospital, Detroit	225	7,034
	William J. Seymour Hospital, Eloise	1,450	7,452
	Hurley Hospital, Flint	417	10,300
	Blodgett Memorial Hospital, Grand Rapids	132	3,410
19.	Minneapolis General Hospital, Minneapolis	616	10,021
	University Hospitals, Minneapolis, and others	450	9,203
20.	Mississippi State Charity Hospital, Vicksburg	75	2,944
21.	Boone County General Hospital, Columbia	46	969
	University Hospitals, Columbia	150	2,941
22.	Kansas City General Hospital, Kansas City	435	10,842
	Kansas City General Hospital No. 2 (col.), Kansas City	250	3,158
	Kansas City Tuberculosis Hospital, Kansas City	260	316
23.	Firmin Desloge Hospital, St. Louis	223	5,012
	Mount St. Rose Sanatorium, St. Louis	135	345
	St. Mary's Hospital, St. Louis	275	6,242
24.	Murray Hospital, Butte	120	2,666
	Montana Deaconess Hospital, Great Falls	160	2,809
	Walker Laboratory, Great Falls, and others	.....	.....
25.	State Public Health Laboratory, Lincoln	.....	.....
26.	Dartmouth Med. School Laboratories, Hanover	.....	.....
27.	Anthony N. Brady Maternity Hospital, Albany	54	1,334
	Memorial Hospital, Albany	120	2,584
	Hudson City Hospital, Hudson	103	3,082
28.	Good Samaritan Hospital, Cincinnati	475	10,703
	Good Samaritan Hospital, Dayton	200	4,425
29.	Doernbecher Memorial Hospital for Children, Portland	70	2,323
	Multnomah Hospital, Portland	300	4,516
30.	Allentown Hospital, Allentown	300	7,411
	Allentown State Hospital, Allentown	1,567	265
	Sacred Heart Hospital, Allentown	260	4,486
	St. Luke's Hospital, Bethlehem	192	4,946
	Easton Hospital, Easton	200	4,595
31.	St. Therese Hospital, Beaumont	75	1,944
	St. Mary's Hospital, Gates Memorial, Port Arthur	175	2,400
32.	Dr. W. L. Marr's Clinical Pathological Laboratory, Galveston	.....	.....
33.	McGuire Clinic, Richmond	.....	.....

THE PLANNING OF A SMALL HOSPITAL LABORATORY

By BERNICE ELLIOTT, B.S., M.T.

Bishop Clarkson Memorial Hospital, Omaha, Nebraska
F. L. Dunn, M.D., Pathologist

When the planning of a hospital laboratory is undertaken, many things must be considered. Some arrangements are possible only if planned during the original building of the rooms. Not only the arrangement within the rooms must be considered, but the relationship between the laboratory and the rest of the hospital is important. We feel that it is advisable to locate the laboratory at a distance from the rooms of the patients, but also convenient for nurses who will be coming to the department. Doctors will more often stop to visit, to obtain reports, to explain their desires, and to discuss results if they need not be inconvenienced greatly in order to reach the laboratory.

In the building of our new laboratory we had not all the privileges afforded those planning a new hospital building, because we remodeled and took possession of a building formerly used by another hospital organization. The space occupied by the former laboratory was neither available nor desirable for our use, and we were given two rooms adjacent to the main office of the hospital. The rooms had been used originally for patients. The space occupied by the laboratory is 2% of that occupied by the patients in the hospital.

Our rooms have north light which is ideal for laboratory work. Throughout the day the light is more uniform, and there is no sunlight glare.

Our laboratory is convenient for the doctors, who indicate their presence in the building by the use of a light board, which is a few feet from the entrance to the laboratory. This light board may be seen from the working area of the laboratory so that a technician may at all times know which doctors are in the hospital. Across the hall from the laboratory is the doctors' cloak and waiting room. The doctors waiting for reports or conferring with other doctors may be reached easily without inconvenience to the technician. The main lobby is near and may be used as a waiting place for donors and outpatients. Convenient also are the stairs and the elevators. No patients' rooms are near.

As a basis for starting plans for the interior of a new laboratory, a list of the undesirable features of the old laboratory should be made. The elimination of these features in the new arrangements will initiate a scheme which ought to prove satisfactory to the workers. Draw several possible arrangements, and then picture the activities of the workers in each plan. Consider the direction and the radius of the swing of each door when planning the placement of the furniture. Discard old fashioned and ugly relics which may have been used for years. Consider the general appearance of the finished laboratory. Be sure that everything may be cleaned easily, and see that it is kept clean. Many a laboratory, well planned but ill kept, gives an unfavorable impression.

Wall space for laboratory fixtures is an essential feature to be considered while planning a laboratory. The unity of the laboratory must be planned. To make one large room from our two smaller rooms would not give us the necessary wall space. This was especially undesirable since we did not approve of the laboratory planned around a centrally located table. The inconvenience of reaching across the table for apparatus and of having to retrace ones' steps in encircling the table many times a day seemed unnecessary to us. Difficulty is encountered in trying to illuminate both sides of a large center table. It will be noted that, since one side of the table is more convenient, the other side will be unused a good deal of the time. In order to fulfill our desires, we decided to cut away part of the wall between our two rooms. This would allow us the needed wall space and allow an easy passage from one part of the laboratory to another.

Our rooms were designed to permit working space for three or four people. These workers would do the routine and special laboratory procedures for a 150 bed general hospital.

Departmentalization is more easily accomplished in a laboratory with the working areas located next to the walls. Carefully planned departments, with all of the necessary equipment for each general division of our laboratory work located in a working unit, was our goal. This scheme eliminates any interference between technicians, each of whom will be working in his own department. The tests may be completed with much greater speed if the technician has all the apparatus concentrated in one area. Division of assignments for work have significance since each technician may work very independently of each other.

The working portion of our laboratory does not contain apparatus used so seldom that it should be stored. Our shelves for reagent

bottles are narrow and are planned to hold only the reagents used daily. In the drawers belonging to the different departments only the commoly used essentials are found. Concentrating the storage space relieves the rest of the laboratory from small and inconvenient shelves and cupboards. This concentration arrangement adds to the neatness and general appearance of the rooms.

Our general floor plan is shown in the drawing. Departments included are the urinalysis, the microscopy, the requisition, the chemical, the tissue preparation, the library, the office, and the storage. No central area is unused, but there is also adequate passage space between departments.

Each department has ample space for its purpose and bears a direct relationship to the rest of the laboratory. Because a urinalysis also includes a microscopic test, these departments are adjacent. The microscopy and chemical departments share a sink, however the double drain board provides a division for each department. The tissue department is located adjacent to the table area on the east where ample space is provided for microtomes, staining jars, and the paraffin oven. Current tissue files and reports are found in the desk across from the tissue department. Comfortable desk space for figuring results from chemical tests is found but two or three steps from this department. The microscopy and tissue departments are located in front of windows, so that day light, which in our laboratory is an ideal north light, may be used for the microscopic illumination if desired.

On the short wall, the west side of the partition, we have the refrigerator and the requisition shelf. This shelf is equipped with telephone, bulletin board, lamp, two drawers, the spindle for requests, and the requisition book. Notation of every specimen of any sort brought to the laboratory or requisition of any test ordered by a doctor is made in the requisition book. The nurses feel more responsibility and are more careful in the bringing of the specimens and requisitions because of this system, and a definite record of the work to be completed is available. Because the refrigerator is adjacent to this shelf and the urinalysis department is a few steps across the room, nurses bringing requisitions and specimens need never enter the working area of the laboratory, but only a small area near the door.

Our urinalysis department extends the entire length of our west wall. Included here are the sink and drain board, shelf for urine bottles, drain rack for fifty test tubes, gas plate burner, eight feet of table space, and eighteen feet of narrow shelf space for reagent bottles. A high shelf above the sink holds our sterilizing oven and

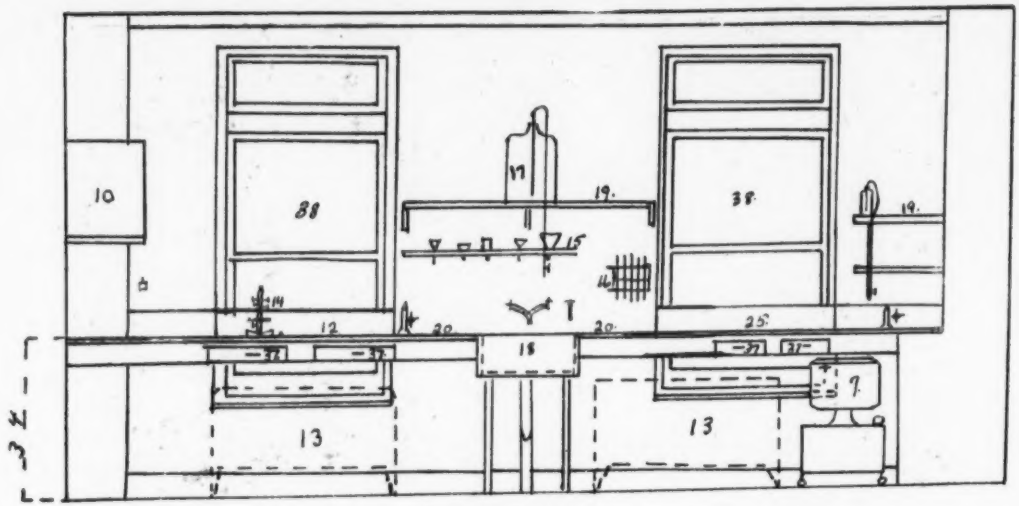
a large bottle equipped with siphon and filled with Haines solution. On a high wheeling base fitted with casters, our centrifuge is kept beneath the working table and is easily rolled out when in use. This is a definite improvement over the machine with a fixed base. Awkward and inconvenient movements necessary to fill and empty the centrifuge are eliminated, yet the machine is always ready when desired and always out of the way when not in use.

Our microscopy department is located on the north in front of a window. Seven feet of table space is here provided. A bacteriology drawer and a hematology drawer are located beneath this table. Convenient are the refrigerator and the incubator which is supported on a shelf above the table. Here we prepare our bacteriology slides and cultures. A sink adjacent is used for staining. Usually one technician is busy here doing blood counts, and there is adequate space for another technician to work on blood matchings or to prepare and stain bactriology slides. Our large sink, deep enough for washing long chemical pipettes and with two lead drain boards, separates the microscopy and the chemistry departments. One drain board contains the rack for stains for hematological and bacteriological work. Here also we have our glass staining dish and our suction for cleaning blood count pipettes. The other drain board is used when washing chemical dishes. Above the sink and drain board we have a drain rack for chemical dishes, a rack for chemical pipettes, and an overhead shelf for bottles of distilled water and formalin. The table to the east of the large sink is used alternately for chemistry and tissue slide preparation. A drawer for each department is located beneath this table. Here we have shelves equipped with bottles and burettes for commonly used solutions. The colorimeter equipped with artificial light is located away from the day light but also convenient to the chemistry table.

The cupboards and drawers extending the entire length of the east wall provide storage space for pathological specimens, chemicals, and glassware. On the table space between the lower and upper cupboards are located the rotary and freezing microtomes, an analytical balance, the paraffin oven, the colorimeter, and a small syringe sterilizer. A Van Slyke blood gas apparatus is located on the south wall near the cupboards.

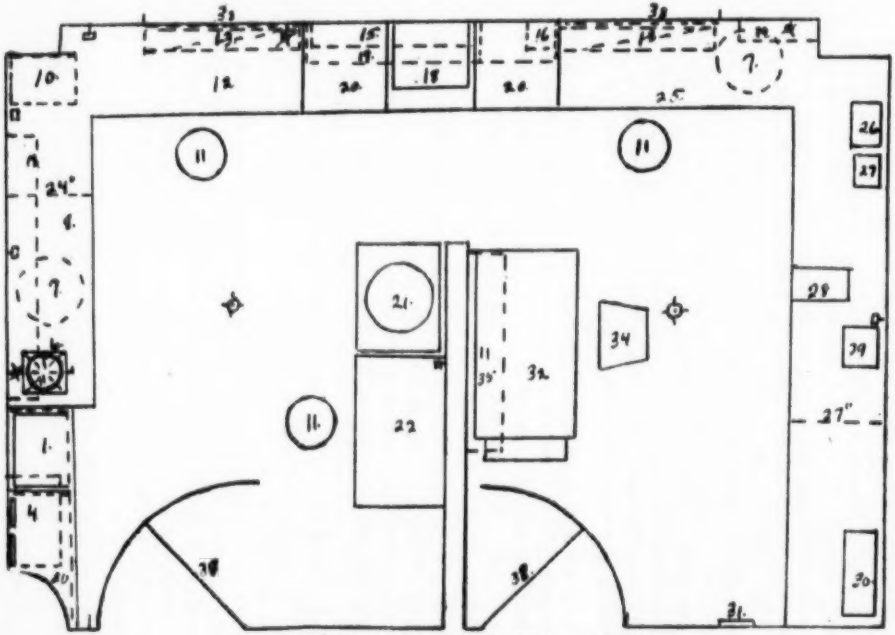
On the east side of the partition we have our desk and library. The closet across the hall provides storage space for large bottles of solutions, laboratory reports, large pieces of glassware, and yearly supplies of laboratory essentials. An autopsy room located on another floor provides storage space for histological specimens.

Gas, water, and electrical connections must be carefully consid-



NORTH WALL

1. Urinalysis Sink
2. Test Tube Rack
3. Bottle of Haines Solution
4. Gas Oven
5. Paper Towel Rack
6. Gas Plate
7. Centrifuge
8. Urinalysis Table
9. Lamp
10. Incubator
11. Stool
12. Microscopy Lamp
13. Radiator
14. Microscope
15. Drain Board for Glassware



FLOOR PLAN (Scale ⅜" x 1'10")

16. Pipette Rack
17. Bottle of Distilled Water
18. Utility Sink
19. Shelf for Bottles
20. Drain Board
21. Refrigerator
22. Requisition Shelf
23. Telephone
24. Bulletin Board
25. Chemistry and Tissue Table
26. Freezing Microtome
27. Rotary Microtome
28. Colorimeter
29. Paraffin Oven
30. Analytical Balance
31. Desk
32. Van Slyke Blood Gas Apparatus
33. Registry Certificates
34. Chair
35. Shelf for Books
36. Cupboard
37. Drawer
38. Window
39. Door

ered early in the building of a new laboratory. About sixteen electrical plugs are distributed throughout our two rooms. Our rooms are illuminated by a large reflector light in the center of each room. In addition large special billboard reflector lights are located above the urinalysis table and above the table used for chemistry and tissues. These light the table well without glaring in the eyes of the workers. Lamps also illuminate the desk and the requisition shelf. Two sinks are convenient and are adequate for the number of workers using them. We have double gas connections on the urinalysis table, on the microscopy table, and on the chemistry table. Radiators are located underneath each of the north tables.

We used a heavily waxed linoleum as a covering for our work tables. Strong alkalies and fat solvents will attack this surface. However with reasonable care the linoleum is attractive and serviceable. A washable glossy light gray paint covers the wood surfaces and the walls of our rooms. We prefer our table coverings and light washable paint to the black acid-proof paint often found in laboratories. Repainting the wood surfaces and walls is more easily accomplished. The newer paints are also sufficiently resistant. A light and cheerful atmosphere is possible when a light color of paint and linoleum is used. Our drain boards are of molded lead sheet. A waxed linoleum covers the floor.

A convenient working height must be planned. Our tables are forty inches from the floor since most of our work is done while we are standing up. We use twenty-nine inch stools when doing microscopy work. This provides a comfortable arrangement for the worker.

One should consider available furniture before planning the building of the new furniture. We decided to use old equipment only as it served our purpose. A large awkward center table from our old laboratory, when split lengthwise, provided a thirteen foot wall of table space with drawers and cupboard space below. A discarded record file with sliding doors became cupboard space above this table on the east side of our laboratory. An unused linen closet across the hall completes our provision for storage of apparatus and supplies. Our objective, to have adequate and concentrated storage space, was thus accomplished. We were able to use our old soapstone sink to which was attached a lead drain board. We did not feel, however, obliged to use old equipment and in every case where its use was incompatible with the new scheme, we discarded the old equipment.

After general plans have been made, one or more interviews with the architect or contractor ought to clarify the minor details of

arrangement and construction. The architect should not be expected to plan the detailed arrangement of the laboratory because only one who understands the activities of the department can plan the desired arrangements. The architect should carry out the desires of the pathologist and of the technician by putting them into form for the actual construction of the rooms. Constant supervision during the building process is necessary to assure the satisfaction of the pathologist and of the technician. Do not be afraid to change plans during construction, but also consider the time, inconvenience, and expense involved in the changes. Be firm and considerate in your requests, but also take graciously any disappointment if these are not fulfilled.

Summary

1. The arrangement of the laboratory of the Bishop Clarkson Memorial Hospital of Omaha, Nebraska, is described.

2. General features to be considered and policies to follow when planning the building of a laboratory are presented.

We wish to thank Architect Frank Latenser for help received while planning and building our laboratory.

BOOK REVIEW

DISEASES OF THE BLOOD AND ATLAS OF HEMATOLOGY with Clinical and Hematologic Descriptions of the Blood Diseases Including a Section on Technic and Terminology by Roy R. Kracke, M.D., Professor of Bacteriology, Pathology and Laboratory Diagnosis, Emory University School of Medicine. Pathologist to the Emory University Hospital. Consultant in Hematology to the Grady Hospital and Eggleston Hospital for Children, Atlanta, Ga. Formerly Director of the Hematological Registry, American Society of Clinical Pathologists and Hortense Elton Garver, M.S., Instructor in Laboratory Diagnosis, Emory University School of Medicine. Pp. 532, including 44 color plates illustrating more than 300 separate blood cells and 17 other illustrations. Publishers, J. B. Lippincott Company, Philadelphia (London-Montreal). Price $15.00.

So much new knowledge has accumulated in the field of hematology of recent years that the subject has come to be almost a specialized one not only from the laboratory side of technic but from the clinical aspect as well. A valuable contribution to the outstanding medical literature has been made by Dr. Kracke in this excellent work on Diseases of the Blood and Atlas of Hematology.

Considerable confusion has existed in hematologic nomenclature. The inclusion of this subject in Section I is not only timely but necessary to a correct understanding of the various terms employed to designate one and the same thing. Thus, the most recently discovered blood dyscrasia, namely, agranulocytosis, has over 20 different names. By the inclusion of this section the author has here performed a definite service in bringing order out of chaos. Some other branches of medicine could well follow suit with benefit to all.

The development and morphology of blood cells is thoroughly discussed in Section II with diagrams accompanied by the beautifully colored plates of Miss Garver. The various theories of the origin and development of the blood cells are given ample consideration.

The remaining sections take up leukocytosis and leukopenia; the anemias; the leukemias; hemorrhagic diseases; miscellaneous; hematologic technic. Suffice it to say that each of these subjects is discussed thoroughly and authoritatively. The section on miscellaneous topics includes infectious mononucleosis, polycythemia vera, the bone marrow, malaria, blood groups and blood transfusion and the blood picture of normal laboratory animals.

There are other outstanding features of this work that demand attention. Perhaps foremost among these should be mentioned the admirable manner in which the author has linked up treatment with the discussions of the anemias and other blood diseases. This makes the work most attractive for the clinician. In essential thrombocytopenic purpura for example, the author tells when splenectomy should be performed and when it should not be done and emphasizes that failure after splenectomy may be due in some instances to incorrect diagnosis. In polycythemia vera he gives all the methods of treatment that have been tried and found wanting as well as the best methods discovered to date.

Symptoms, physical findings, clinical course, prognosis, incidence and, when possible, etiology and pathogenesis are given accurately, concisely and authoritatively. An adequate bibliography follows each chapter and includes important sources of material from both American and European literature. In subjects under controversy a fair opinion is given based on the author's wide experience and after all phases of the subject are taken into due account.

The style of writing is simple, direct and readily understandable. Words are not wasted—every sentence is "meaty." Reading is effortless and one's interest is sustained for long periods without tiring.

The author has realized the need for a volume including both the clinical and laboratory phases of diseases of the blood. He has performed this task exceedingly well and is to be highly commended for his accomplishment and for his contribution to the outstanding works of medical literature.

NEWS AND ANNOUNCEMENTS

OFFICERS A. S. M. T.

1938-1939

CHRISTINE SEGUIN, M.T.
President

President-Elect—BERNICE ELLIOTT, M.T.

Vice-President—ARTHUR COAD, M.T.

Secretary—LUCILLE BROWN WALLACE, M.T.

Treasurer—HERMINE TATE, M.T.

Administrative Secretary—JOHN H. CONLIN, M.T.

The sixth annual convention of the American Society of Medical Technologists held in San Francisco, California, showed a continued advance in the presentation of scientific papers and exhibits. A favorable registration of delegates represented 23 states. At the close of the fiscal year membership in the National organization presented a continued growth with the membership roll at the highest since its inception.

The annual banquet was held June 15, 1938, at 6:30 p. m. in the Richelieu Hotel. Miss Frieda Ward substituted as toastmistress for Miss Marian Baker who could not be present.

The first speaker was Dr. Davidsohn of Illinois, a member of the Board of Registry, who gave us an interesting little talk on "The Definition of a Clinical Pathologist."

Dr. Ikeda, also a member of the Board of Registry, announced the awards as follows:

Silver Medal—Miss Ida Lucille Brown—"Type Incidence of Pneumococcus Infections in Oklahoma."

Bronze Medal—Miss Phyllis Stanley—"The Museum in the Small Hospital."

Bronze Medal—Miss Dorothy Asher—"Studies in Experimental Dehydration."

Dr. Maynard, ex-president of the American Society of Clinical Pathologists, was our next speaker.

Dr. Hillkowitz, chairman of the Board of Registry, spoke and told us how pleased he was with the interest shown in post-graduate study.

Dr. Toskett, a member of the Board, spoke as did Dr. Kracke, Mrs. Anna R. Scott, Dr. Konzelmann and Dr. Benner.

A roll call followed showing seventeen states represented.

Mrs. Christine Seguin, the incoming President, gave her address.

Miss Bernice Elliott, president-elect, was introduced, after which all officers were introduced.

The banquet was then closed by the toastmistress, Miss Ward.

Kentucky

We have been notified of the formation of the Louisville Society of Medical Technologists. We extend our best wishes for success to this, the newest of state organizations.

Minnesota

The fifteenth annual convention of the Minnesota Hospital Association and allied organizations was held in the Nicollet Hotel, Minneapolis, Minnesota, May 19, 20, 21, 1938. This is the second year that the Medical Technologists, as an allied organization have been privileged to convene.

The program of specific interest to the medical technologists of the state was as follows:

Friday Morning, May 20—

"A General Survey of Medical Technology in Minnesota," a paper by Chauncey H. Winbigler, Pres. of Minn. Society of Medical Technologists.

A luncheon at 12:15 with Mary Kane, Pres. of Twin City Socity of Clin. Technicians, presiding.

Friday Afternoon, May 20—

Business meeting, Chauncey H. Winbigler, president, presiding.

At this time the society ratified a set of By-Laws and made provisions for a Constitution for the coming year. A complete slate of officers was elected for the ensuing year as follows:

President—Edith V. Damgaard, Duluth Clinic, Duluth.

President-Elect—Frieda Claussen, Miller Hospital, St. Paul.

Vice-President—Dorothy Wilkins, Webber Hospital, Duluth.

Secretary—Laila Punkari, Ancker Hospital, St. Paul.

Treasurer—Sr. M. Edeltrude, C.S.J., St. Joseph's Hospital, St. Paul.

Directors—Martha E. Strolberg, Med. Arts Bldg., Mpls. (For 3 yrs.); Adelaide Evenson, Mpls. Gen'l. Hosp., Mpls. (For 2 yrs.); Valborg Jordahl, Naeve Hospital, Albert Lear (For 1 yr.).

Chauncey H. Winbigler remains among the number of officials in the capacity of Immediate Past President where his influence and experience will be an asset to the organization.

Out of distinction for the interest shown the society a unanimous ballot was cast inviting Dr. W. A. O'Brien, Associate Professor of Pathology of the U. of M., and Dr. Kano Ikeda, Secretary of the Board of Registry for Medical Technologists of the American Society of Pathologists, to become honorary members of the Society.

The Scientific program followed, Grace Zchiesche, presiding: Opening address, Wm. A. O'Brien, M.D.; "History and Aims of the Board of Registry," Kano Ikeda, M.D.; "Pneumo Typing," Wesley Spink, M.D.; Round Table, John Noble, M.D.; "The Rytz Test," F. Rytz.

At 6:30 an informal banquet with the members of the Minnesota Hospital Association and the other allied organizations followed.

Saturday, May 21, 1938—

The University Hospital laboratory was opened to the technologists and demonstrations were set up in the Rytz Test (a flocculation test) and some of the more recent clinical chemistries as for example the determination of sulphanilamide in blood. The Zoological building housed a demonstration in parasitology by Dr. Riley, and Millard Hall a similar demonstration in bacteriology, set up by

Dr. A. T. Henrci.

Membership in the Minnesota Society of Medical Technologists is synonymous in registration with the Registry at Denver, which therefore starts the roll in Minnesota with over one hundred eighty individuals. The goal is to make the total census of the state consist of registered members and with this in mind the society launches forth on its third year of activity.

Missouri

The Missouri Society of Medical Technologists met in their annual one-day convention at St. Joseph's Hospital, Boonville, Missouri, May 7.

The meeting was called to order by the President, Sister Mary Bernard. Invocation by Very Reverend Monsignor H. Schilling of Boonville, Missouri. Address of Welcome by W. E. Stone, M.D., F.A.C.S. Papers were presented by Dr. Lloyd R. Jones of St. Louis University, Dr. R. W. Kerr of St. Joseph's Hospital, Kansas City, Mo., Dr. C. J. Heifeitz of Jewish Hospital, St. Louis, Mo. Mr. Frederick Loose, De Paul Hospital, St. Louis, Dr. N. R. Ziegler, Missouri University, Columbia, Missouri, and by Dr. Edward W. Kline, University of Missouri, Columbia, Missouri.

At 12:30 p. m., a Rose Bud Luncheon was served at the hospital and a musical program given through the courtesy of Bertha Jaeger and the cadets at Kemper Military School.

The following officers were elected for the year 1938-1939: President, Olive Stone, St. Louis, Mo.; Vice-President, Sister Mary Irmena, SSM., Kansas City, Mo.; Secretary, Sister Mary Asteria, SSM., Jefferson City, Mo.; Treasurer, May Baldwin, Springfield, Mo.; Executive Member, Sister Mary Francis, SSM., St. Louis, Mo.

Scientific Exhibitors, A. S. Aloe Co., St. Louis, Mo.; Lederle Laboratories, Kansas City, Mo.

Sister Mary Iremena, SSM., presented an exhibit.

Minutes of the Executive Sessions of the Sixth Annual Convention of the American Society of Medical Technologists held at Young Men's Institute Building, San Francisco, Cal., June 13-14-15, 1938

MONDAY MORNING, JUNE 13, 1938:

The sixth annual convention of the American Society of Medical Technologists was called to order by the President, Miss Frieda Ward.

The invocation was offered by Lt. Col. McKenzie, Chaplain of the United States Army of the Presidio, San Francisco, California, after which the meeting was adjourned to allow those arriving to register.

When the meeting reopened the minutes of the 1937 convention were read by the Secretary. A motion was made by Mr. Brice, seconded by Mrs. Seguin, that the minutes be approved as read. The motion was carried.

The President then appointed the Publicity Committee including the following members: Mr. Fitzgerald of Portland, Maine; Mr. Falconer, of Sioux Falls, South Dakota, and Mr. Coad of Los Angeles, California.

It was announced that other committees would be appointed at a later time.

The Entertainment Committee then gave a report. Miss Elliott, of Omaha, Nebraska, told of plans for Tuesday afternoon and evening. A trip was planned to go by bus over the new bridge to visit the Highland Hospital at Alameda, California, and to tour the grounds of the University of California. A fish dinner at Neptune's near Fisherman's Wharf was to follow. In the evening a trip through Chinatown was scheduled. She also announced that the banquet would be at the Richelieu Hotel on Wednesday evening at 6:30 p. m.

A message of welcome given by Miss Frieda Ward, President, followed. She also told how the membership had increased so that now it is over 500, called our attention to the exhibits and spoke briefly on our problems, the most important one being state licensure.

In the absence of Miss Luella Gifford, Chairman of the Executive Committee, the report of said committee was read by the Secretary. The report included the following:

A new bookkeeping system for the Journal was installed and the books were audited to the satisfaction of the Chairman except for two items, one of $22 and one of $7, which are not chargeable to the Journal.

The Treasurer's books were verified.

The committee expressed an opinion that a more effective method of obtaining new members be devised than our present one of sending special issues of the Journal to all registered technicians. One hundred and fifteen new members were admitted at a cost of $360.31, the expense per member in excess of $3.00.

The committee recommended that all funds of the Society be put into one bank account and that the duly elected treasurer receive and deposit all money. At present there is also a bank account in Detroit. About one-third of the total income of the year ($3,000.00) was received from the Journal and slightly more than two-thirds from membership dues.

It was also recommended that all membership dues be made out to the Society and forwarded direct to the Treasurer.

A letter from the New Jersey Society of Medical Technologists was embodied in the report including suggestions for bettering the Society. One of these suggestions was regarding the different state societies affiliating with the National Society. Another was to the effect that the books and accounts of the Society must be available to members at the annual meeting and another that no officer should be retained in office more than three years.

The report closed with a request that the incoming President at once appoint a Constitution Committee to review our constitution and have a revised copy ready to be voted upon at the next annual meeting.

A motion was made by Miss Stanley that the report be accepted as read and that the suggestions be followed.

The Administrative Secretary, Mr. John H. Conlin, felt that the two items should be explained. The $7.00 was for a subscription to the Journal of the American Medical Association. He felt that in view of the fact they published a survey of the registered schools for medical technologists and other items of interest to the Society that this subscription came under the phrase of the constitution that the Administrative Secretary conduct all business pertaining to and edit the Journal. The Administrative Secretary, knowing there was some feeling of doubt concerning the books in his office, called in the Michigan Auditing Company to audit them before leaving for the 1937 convention in Atlantic City. Their bill was the $22.00 item.

An opinion was expressed by Mr. Brice that the Society should amend its present constitution instead of drawing up a new one. In view of this he felt the report of the Executive Committee should not be accepted. The Administrative Secretary read a letter from our legal counsel, Leroy Abt, dated December, 1937, stating that the Society was now chartered and incorporated, that if a new constitution was adopted this would be null and void and also our membership must be dissolved.

At this time two motions were on the floor neither of them seconded. Miss Stanley restated her motion to read that the report of the Chairman of the Executive Committee be approved as read and that an addition be made of a written explanation by the Administrative Secretary of the two items so there would be no misunderstanding in the future when the report might be read.

At this time Mr. Fitzgerald wished to second Mr. Brice's motion. Mr. Brice restated his motion that the report of the Executive Committee be accepted as read with the exception that the words "a Constitution Committee to review our constitution" be changed to read a committee to amend our present constitution. This motion was seconded by Mrs. Seguin. Miss Stanley desired to make an addition to the motion that we ask Mr. Conlin to explain the two items and cover everything at once. Mr. Brice felt that his motion should stand as stated. It was carried.

Miss Stanley made a motion that an addition be made of a note explaining the two items so there could be no question in the future. This motion was seconded by Miss Snow and carried. A copy of this report is on file.

A report of the American Journal of Medical Technology was then given by Mr. John H. Conlin. It was based on the report of the auditing company (Haskins and Sells). Receipts for the year amounted to $1,039.19, disbursements $1,026.23. There was an excess of $11.96 of recorded receipts over disbursements. The cash balance on hand July 1, 1937, was $117.55. The cash balance on hand April 30, 1938, was $119.51. Mr. Fitzgerald moved that the report be accepted and that a vote of thanks be given Mr. Conlin for the year's work. This motion was seconded by Miss Tate and carried. A copy of this report is on file.

The annual report on membership was also given by Mr. Conlin. It, too, was based on the auditor's report. On May 23, 1938, there were 116 new members and 426 old members in good standing. Since the audit eight paid their dues, making a total of 550 members in good standing. In the past year 60 old members have been dropped by request or for failure to pay dues. It was also stated that 71 of the 116 new members were obtained through the special issue of the Journal sent complimentary by the Society. It was moved by Miss Lyle and seconded by Mr. Fitzgerald that this report be accepted as read. This motion was seconded by Mrs. Seguin and carried. A copy of this report is on file.

The report of the Advisory Board was given by Miss Phyllis Stanley, Chairman. The Board verified 140 applications of which 116 have completed membership by paying the four dollars dues. The Board received no complaints concerning the conduct of members. Miss Stanley moved that the report be accepted as read. This motion was seconded by Mrs. Seguin and carried. A copy of this report is on file.

Continued in September issue of Journal (Vol. 4, No. 5)